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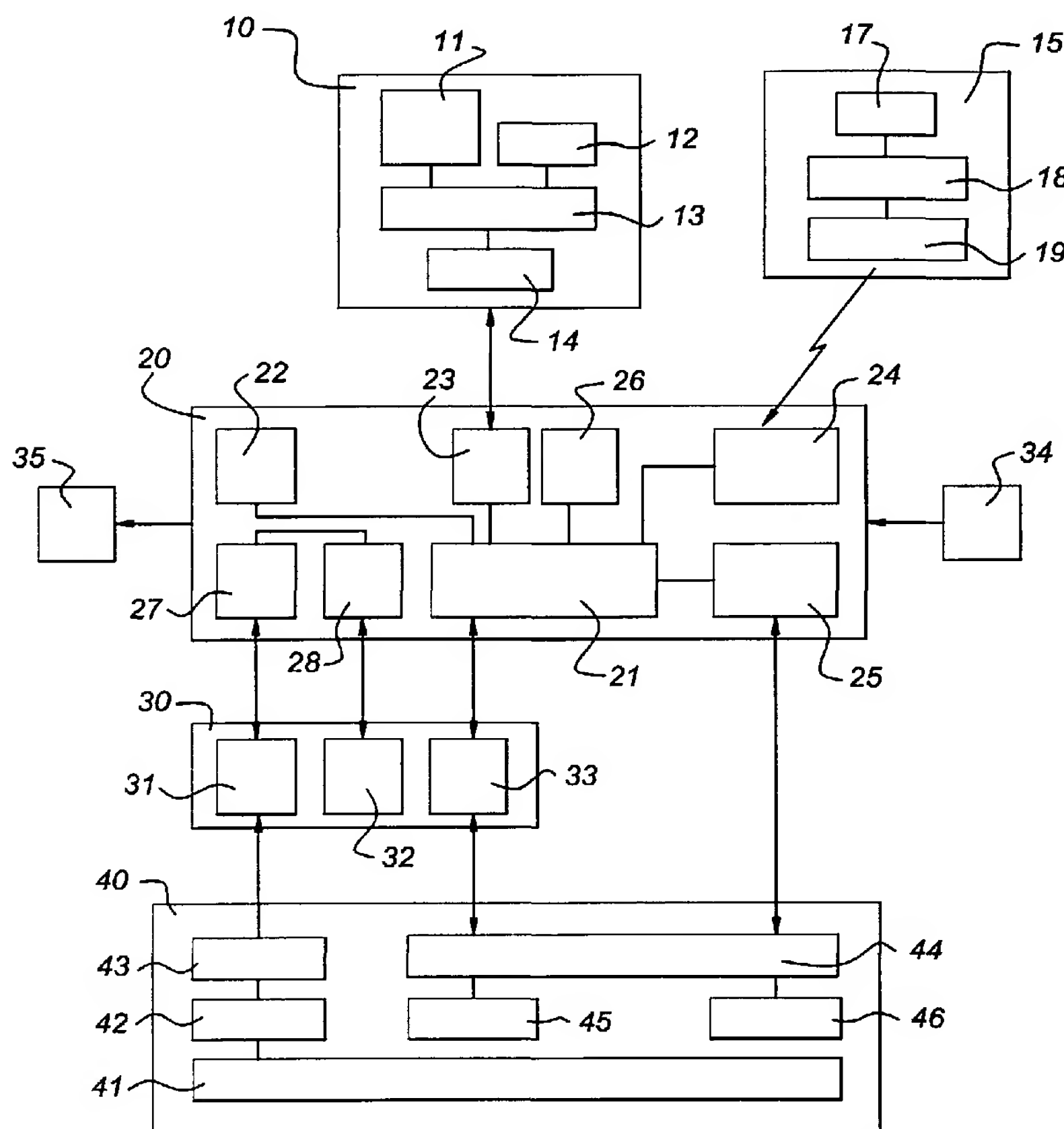
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[Continued on next page]

(54) Title: SYSTEM FOR MONITORING PHYSIOLOGICAL PARAMETERS OF PERSONS



(57) Abstract: Body local area network comprising a sensor unit (15) for sensing at least one parameter, a display unit (10) for displaying information related to the at least one parameter, and a processing unit (20) for receiving, processing and storing data from the sensor unit (15) and for controlling the display unit (10), in which the processing unit (20) comprises a mobile telephony module (25), such as a GSM module, UMTS module or two-way pager, for providing a wireless communication link. The processing unit (20) is preferably provided with a rechargeable battery (28). The body local area network may further include a GPS module (26) and/or an MP3 player module (27). The body local area network may further use a docking station (30) for charging the rechargeable battery (28), providing an additional Internet interface (33) and for uploading MP3 audio files.



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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## SYSTEM FOR MONITORING PHYSIOLOGICAL PARAMETERS OF PERSONS

The present invention relates to a body local area network comprising a sensor unit for sensing at least one parameter, a display unit for displaying  
5 information related to the at least one parameter, and a processing unit for receiving, processing and storing data from the sensor unit and for controlling the display unit. In a preferred embodiment, the body local area network is used for providing information to a user while sporting.

It is known to provide a watch for use while sporting, the watch being arranged  
10 for interfacing with a heart rate sensor to be worn by the user. The heart rate sensor transmits the heart rate count to the watch via a wireless connection, the watch processing the heart rate count and displaying the heart rate of the user. The known system may be provided with an interface for downloading data to a personal computer, e.g. using a sound signal and the personal computer's microphone. In alternative  
15 embodiments, the watch must be connected to a docking station, or the watch may be provided with an infrared transmitter for sending an infrared signal to an infrared receiver coupled to the personal computer (e.g. an IrDA gate).

The known system has the disadvantage that the user has to bring the watch close to a personal computer in order to download data from the watch to the computer. This  
20 may be a cumbersome procedure, and it is impossible to download data anywhere but on a specific location, usually at home.

The present invention seeks to provide a body local area network which may be used for providing information to a user while sporting, and enables to download training data from any location the user wants.

25 This is achieved with a body information network of the type described in the preamble, in which the processing unit comprises a mobile telephony module for providing a wireless communication link, e.g. with the Internet.

The present invention has the advantage that it allows a user to collect personal training data on a specific site on the Internet using the mobile telephony unit.  
30 Furthermore, the site on the Internet may be arranged to gather information on the Internet from a large number of users, allowing to compare personal training data with general statistical data from a large number of users. Also, the Internet site may be

arranged to provide uploads of training program information to the body local area network via the mobile telephony module.

The mobile telephony module is preferably one of the group of a GSM module, a UMTS module or a two-way pager. This allows data transfer in both directions  
5 between the body local area network and the Internet site, e.g. by using the i-mode protocol. When using a two-way pager, the user can use the more cost effective transmissions of a pager network.

In an embodiment of the present invention the sensor unit comprises a sensor connected to sensor processing means, and transmission means connected to the sensor  
10 processing means, the sensor processing means and transmission means being integrated in a single chip, and the processing unit comprises receiving means for providing a wireless connection between the sensor unit and the processing unit. This allows the sensor unit, such as a heart rate sensor, a bicycle speedometer or an inline skating speed sensor, to be positioned at a most favourable location on the body of the  
15 user, without being bothered by wires running from the sensor unit to the processing unit.

It is furthermore known to provide watches with a number of integrated functions beyond the normal functions of a watch, such as a GPS navigation system, a MP3 audio player or a mobile telephony unit. Such watches tend to become heavy and bulky, and  
20 do not allow any functionality to be added to it. Furthermore, the power consumption of these additional functions will cause a quick drainage of the batteries of the watch.

Therefore, in a preferred embodiment of the present invention, the processing unit and display unit both comprise communication means for two-way communication using wireless transmission. This allows the display unit to be worn on the wrist or any  
25 other convenient location on the user's body allowing easy viewing, while the processing unit may be worn on a different part of the body, where it can be worn comfortably, even if the weight or dimension of the processing unit increases.

In a further embodiment, the display unit comprises programmable input means for user control and input. This allows the user to control the various functions of the  
30 body local area network via the display unit.

The processing unit may be expanded by adding additional modules to the processing unit, for providing additional functionality to the body local area network, such as an MP3 audio player module, a GPS navigation module, etc.

The processing unit comprises, in a further embodiment, a rechargeable battery, the processing unit being connectable to a docking station, and the docking station comprising a battery charger for recharging the rechargeable battery. The docking station may be located at the user's home or any other convenient location, such that the processing unit battery may be charged. As the processing unit may be expanded to have multiple extension modules which each require additional power, this is an economical and simple manner of providing power to the processing unit.

In a further embodiment, the docking station further comprises a modem module connectable with the processing unit for providing an additional interface with the Internet, either directly or via a personal computer. This allows the user to exchange data with the Internet site via an alternative path. When, e.g., downloading large amounts of data, this may provide a more economical procedure than when using the mobile telephony unit.

In an even further embodiment, when the processing unit is equipped with an MP3 audio player module, the docking station may comprise an MP3 upload module. The MP3 upload module enables uploading of MP3 audio files into the processing unit. In an embodiment, the MP3 audio files comprise instructions and directions for training by the user.

The present invention will now be discussed in further detail by a number of exemplary embodiments, with reference to the accompanying drawings, in which

Fig. 1 shows a schematic diagram of the body local area network according to an embodiment of the present invention; and

Fig. 2 shows a schematic diagram of the body local area network according to a further embodiment of the present invention.

Fig. 1 shows in a schematic representation the body local area network system according to a preferred embodiment of the present invention.

In general terms, the body local area network system according to a preferred embodiment of the present invention comprises four major components. A display unit 10 is provided for displaying information to the user, and one or more sensing units 15 are present to provide data which is relevant to the user, e.g. during exercise of a sport, such as a heart rate sensor or an inline skate speed sensor. A processing unit 20 is provided for interfacing with the sensing units 15 and processing the data and to interface with the display unit 10. A docking unit 30 is present for providing a docking



station for the processing unit 20. In Fig. 1, a fifth component is indicated with reference numeral 40, representing an Internet unit. This Internet unit 40 may be present on a host computer and may provide data relevant to the user of the present system. In the following, the various components and their functions will be explained  
5 in further detail.

The system comprises a display unit 10, which comprises a display screen for showing graphical and textual information, and a number of buttons or input devices 12. It will be clear, that depending on the application of the display unit 10, a smaller or larger number of buttons 12 may be present or a different type of input device 12.

10 The display unit 10 comprises a display screen 11, which may be a dot matrix screen with a good resolution, e.g. having a pixel size of 0,3 mm. The display screen 11 is connected to and controlled by a display processor 14, to which also the buttons or input devices 12 are connected. The buttons or input devices 12 may be soft keys, of which the function may be programmed in the display processor 13. Furthermore, the  
15 display unit 10 comprises a display interface unit 14, which is connected to the display processor 13 and provides an interface to the processing unit 20. The display unit 10 may be embodied as a modular wrist watch, which can be worn with a wrist band, wrist protector, or can be clipped onto clothing (such as on a wrist guard used in inline skating). Preferably, the display unit 10 is provided with its own power supply, such as  
20 a (rechargeable) battery or a electro-voltaic light cell. The display unit 10 may in a further embodiment (not shown) be equipped with clip-on modules that require mounting on the wrist, such as a compass (for sailors and hikers), a wind speed meter (for sailors) or a wrist acceleration meter (for golf and/or tennis players). For better viewing, the display unit 10, or at least the display screen 11, may be pivotably  
25 mounted, to enable a better viewing angle in certain sports (like rowing and kite-sailing).

In a preferred embodiment, the display unit 10 is arranged to perform a number of basic watch functions, such as (dual) time and date in an analog or digital display, timer and stopwatch.

30 The sensor unit 15 comprises a sensor 17, such as a heart rate sensor or a speed sensor, which is connected to a sensor processing unit 18. The sensor processing unit 18 is connected to a data transmitter 19 for transmitting a sensor data signal. The speed sensor 17 may, e.g., be attached to an inline skate. By appropriate design, the speed

sensor 17 may detect a magnetic part on a rotating wheel of the inline skate, e.g. by using a reed relais or a magnetic Hall sensor. Preferably, the sensor unit 15 is an integrated unit, comprising the sensor 15, sensor processing unit 18 and transmitter 19.

5 The display unit 10 may be arranged to couple with a number of sensor units 15 which are arranged as clip-on items, such as a compass (for sailors and/or hikers), a wind speed meter (for sailors), a wrist acceleration meter (for golf and tennis players) or an altimeter. As the sensor units 15 operate by a wireless link, no electrical sockets are needed to connect the sensor units 15 to the display unit 10, and the sensor units 15 may be equipped with a waterproof housing.

10 Preferably, the data is transmitted from the sensing unit 15 to the processing unit 20 by wireless transmission, preventing the use of wires which would hamper the freedom of movement of the person wearing the display unit 10. This can be realised by using an appropriate sensor processing unit 18 which processes the sensor signal to be transmitted by the transmitter 19. The transmitter only needs a short range  
15 capability, allowing the use of a small battery to power the sensor unit 15, but should have a high reliability. This high reliability may be achieved by using an integrated chip technology, in which the sensor processing unit 18 and transmitter 19 are integrated in a single CMOS chip. Using such an integrated chip, it is also possible to code the sensor signal, such that no interference occurs with other users of the present  
20 body local area network system.

In the present system, one or more sensor units 15 may be used in parallel. To discriminate the signals from the various sensor units 15, the signals may be coded in a manner known to the person skilled in the art. Apart from the speed sensor and heart rate sensor, other sensor units 15 may be used depending on the type of sport  
25 performed, such as rotation sensors for bicycles, acceleration sensors for running, rowing or swimming and specific sensors for golf or tennis players.

The main part of the present body local area network system is formed by the processing unit 20. The processing unit 20 comprises a central processor 21 connected to memory means 22. The central processor 21 and memory means 22 may be any  
30 known processor type known to the person skilled in the art, such as a microprocessor provided with integrated or separate memory means, such as RAM or ROM. The processing unit 20 further comprises an interface module 23 connected to the central processor 21 for providing an interface with the display unit 10. Preferably, the

interface module 23 is a radio module for providing two way wireless communication between the processing unit 20 and the display unit 10. In that case, the display unit 10 forms the user interface for controlling the processing unit 20.

The processing unit 20 also comprises a receiver module 24 connected with the  
5 central processor 21 for receiving the data signals from the sensor unit(s) 15.

Preferably, the receiver module 24 is arranged to discriminate the various sensor signals, such that multiple sensor units 15 may be operating at the same time. The received sensor signals are processed by the central processor 21 and data relating to time and date are stored in the memory means 22 together with the sensor data.

10 The processing unit 20 is provided with a rechargeable battery 28 as power supply. The rechargeable battery 28 allows the processing unit to be portable and to operate for a sufficient amount of time.

The processing unit 20 may be equipped with a number of optional extension modules which are connected to and controlled by the central processor 21. The  
15 extension modules may be an MP3-player module 27 for playing MP3 audio files (music files or files comprising training instructions) which may be stored in the memory means 22, a GPS module 26 for providing navigational data or a mobile telephony module 25 for providing mobile data and speech communication. The mobile telephony module 25 may be suited for the GSM standard or other (future) mobile  
20 telephony standards such as UMTS, and may e.g. use the i-mode protocol to exchange data. Alternatively, the mobile telephony module 25 is a 2-way pager module, which has the benefit that it is cheaper in operation. To provide an interface with the user for using these modules 25, 27, the processing unit 20 may be equipped with a speaker or earphone 35 and a microphone 34. Preferably, the earphone 35 and microphone 34 are  
25 interfaced with the processing unit 20 via a wireless link.

As an alternative, the optional extension modules 25, 26, 27 may be separate modules having their own housing, which may be clipped onto the display unit 10. In this case, the extension modules comprise a wireless communication interface for communicating with the central processor 21 of the processing unit 20, e.g. via the  
30 radio module 23. As no electrical interfaces (such as sockets) are needed between the extension module 25, 26, 27 and the display unit 10 in this case, both may have a waterproof housing. This enables to use the system in a number of sports in which the



user's wrist may come into contact with water, such as sailing, surfing, etc., or in other sports during bad weather.

The body local area network system according to the present invention may be made available in a number of dedicated configurations, depending on the type of sport or other activity envisaged by the user (such as an inline skater edition, a golfer edition, hiker edition, etc.). The user may wear the processing unit 20 anywhere on the body where it is comfortable, while the display unit 10 may be worn on the wrist, and the sensor unit 15 may be positioned on one of the user's inline skates. The wireless communication between the sensor unit 15 and the processing unit 20, and between the processing unit 20 and the display unit 10 allows such positioning. Also, the size of the display unit 10 may be limited by the use of the processing unit 20, and may be dedicated solely for the function of displaying relevant information.

The processing unit 20 may be placed in the docking unit 30. The docking unit 30 comprises a battery charging unit 32 for charging the rechargeable battery 28 of the processing unit 20. Also, the docking unit 30 comprises a modem module 33, for connecting the processing unit 20 with the Internet (directly or via a personal computer, see below), indicated by block with reference numeral 40. When the processing unit 20 is equipped with the optional MP3 player module 27, the docking unit 30 is equipped with a MP3 upload module 31 for making a connection with the Internet 40 for uploading MP3 audio files. The docking unit 30 comprises a stand and the necessary connections to interface with the processing unit 20.

The docking unit 30 may interface with the Internet 40 directly, or may interface with a personal computer, which is connected to the Internet. When the docking station is interfaced with a personal computer, it is possible to install software for initialising and configuring the body local area network system of the present invention. In this case, it is also possible to download the data of the sensor units 15 as stored in the memory means 22 of the processing unit 20 into the personal computer and process it to provide results in a graphically enhanced presentation.

The Internet, which is shown as block 40, may comprise a specific web site dedicated to users of the body local area network system according to the present invention. The web site may provide various functionalities, such as training programs, communities and downloads. The site may comprise a library of training programs 41 for various kinds of sports. The training programs may comprise spoken instructions

and or tips 42 of which the user can select one or several and compose a personalised training program 43, e.g. in the form of an MP3 audio file which he can upload via the docking station. Furthermore, the Internet site may comprise a personal database 44 for each user, into which his training results can be downloaded from the processing unit  
5 20 via the docking unit 30. At the Internet site, programs may be executed to extract personal statistical data 45 from the training results as downloaded by an individual user, and may also extract general statistical data 46 from the training results from all users. This will allow an individual user to compare his personal training results with that of other users.

10 As an alternative, the connection with the Internet 40 to download sensor data stored in the memory means to the personal database 44 may be achieved directly from the processing unit 20 using the mobile telephony module 25.

Fig. 2 shows a schematic diagram of a further embodiment of the body local area network system. When the processing unit 20 is not equipped with the optional  
15 extension modules 25, 26, 27, the processing unit 20 may be integrated with the display unit 10. The functionality provided by the display processor 13 and the central processor 21 is combined into a single processor, indicated by reference numeral 21 in Fig. 2. The single processor 21 is connected to memory means 22, receiver means 24 and mobile telephony module 25. These components and the display screen 11 and  
20 input means 12 are integrated into a single package forming the display unit 10, and may be worn on the wrist or any other convenient location on the user's body.

The display unit 10 receives data from one or more sensor units 15, which, as in Fig. 1 comprises a sensor 17, a sensor processing unit 18 and a transmitter 19. For exchange of data with the Internet (again indicated as block 40) the mobile telephony  
25 module 25 is used.

CLAIMS

1. Body local area network comprising  
a sensor unit (15) for sensing at least one parameter;  
5 a display unit (10) for displaying information related to the at least one parameter; and  
a processing unit (20) for receiving, processing and storing data from the sensor unit  
(15) and for controlling the display unit (10),  
characterised in that  
the processing unit (20) comprises a mobile telephony module (25) for providing a  
10 wireless communication link.
2. Body local area network according to claim 1, in which the mobile telephony  
module (25) is one of the group of a GSM module, a UMTS module or a two-way  
pager.  
15
3. Body local area network according to claim 1 or 2, in which the sensor unit  
(15) comprises a sensor (17) connected to sensor processing means (18), and  
transmission means (19) connected to the sensor processing means (18), the sensor  
processing means (18) and transmission means (19) being integrated in a single chip,  
20 and in which the processing unit (20) comprises receiving means (24) for providing a  
wireless connection between the sensor unit (15) and the processing unit (20).
4. Body local area network according to claim 1, 2 or 3, in which the processing  
unit (20) and display unit (10) both comprise communication means (23; 14) for two-  
25 way communication using wireless transmission.
5. Body local area network according to one of the proceeding claims, in which  
the display unit (10) comprises programmable input means (12) for user control and  
input.  
30
6. Body local area network according to one of the proceeding claims, in which  
the processing unit (20) comprising a rechargeable battery (28), the processing unit (20)

being connectable to a docking station (30), and the docking station (30) comprising a battery charger (32) for recharging the rechargeable battery (28).

7. Body local area network according to claim 6, in which the docking station  
5 (30) further comprises a modem module (33) connectable with the processing unit (20) for providing an interface with the Internet (40).

8. Body local area network according to one of the proceeding claims, in which the processing unit (20) comprises a MP3 player module (27).

10

9. Body local area network according to claim 8, in which the docking station (30) comprises an MP3 upload module (31) connectable to the MP3 player module (27).

15 10. Body local area network according to one of the proceeding claims, in which the processing unit (20) comprises a GPS module (26).

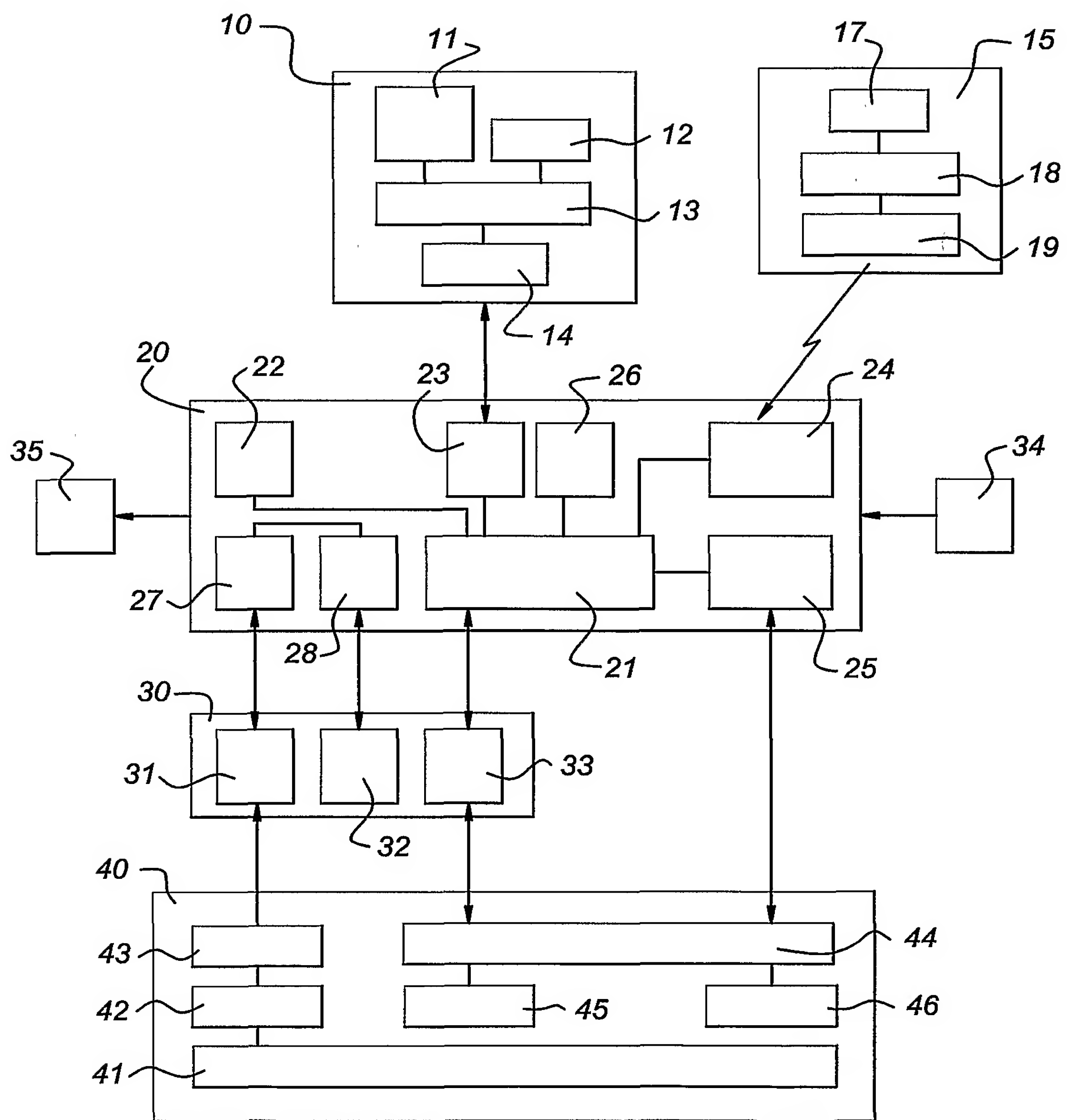
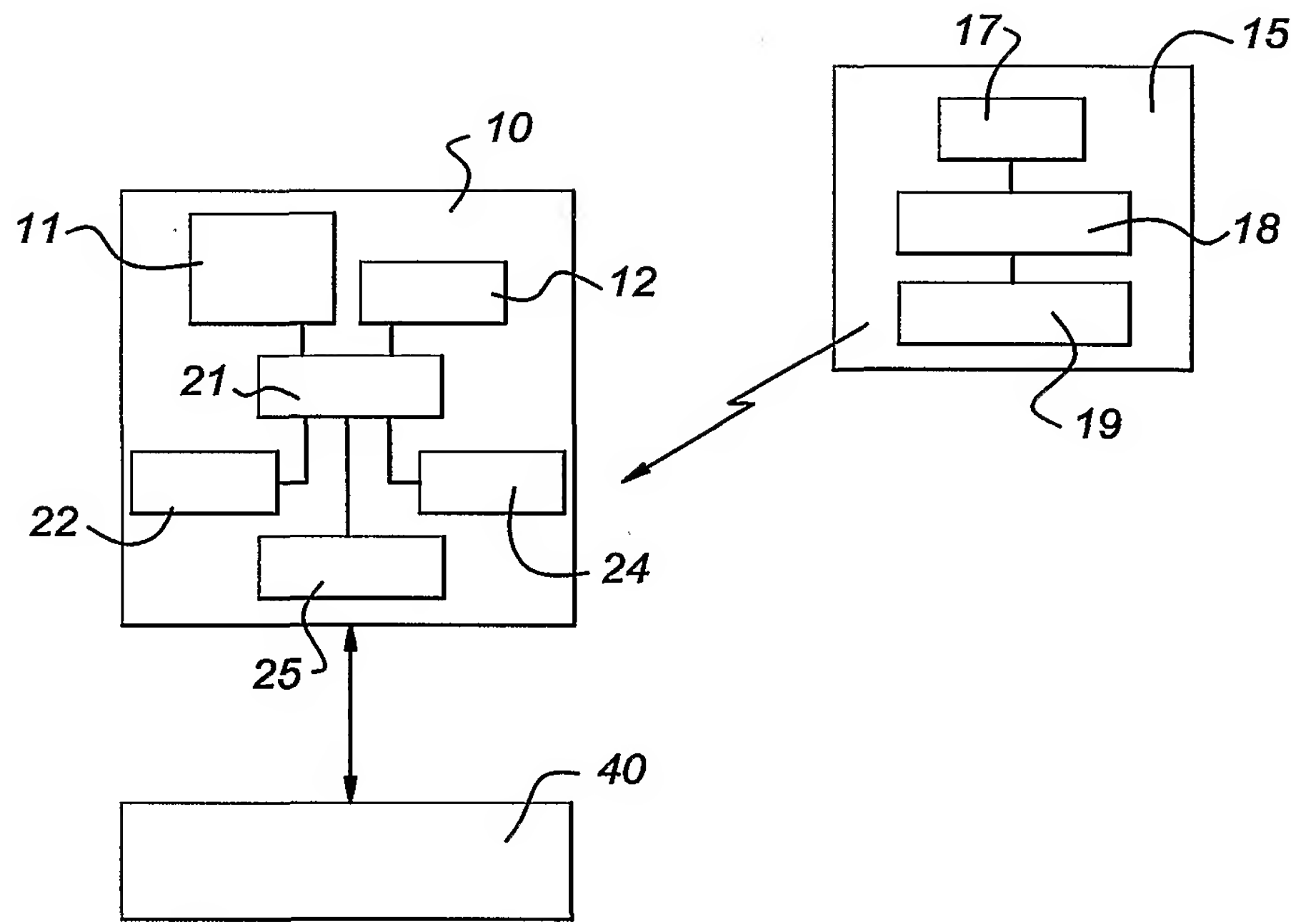
**Fig 1**



Fig 2



## INTERNATIONAL SEARCH REPORT

Int'l Application No  
PCT/NL 00/00743

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 A61B5/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 846 440 A (SARCOS INC) 10 June 1998 (1998-06-10) column 7, line 3 -column 8, line 55 column 10, line 42 -column 11, line 56 ----	1, 3-5, 10
X	WO 99 44494 A (GEVA YAKOV ;CARD GUARD SCIENT SURVIVAL LTD (IL)) 10 September 1999 (1999-09-10) page 7, line 19 -page 11, line 26 ----	1, 2, 5, 10
A	WO 00 52604 A (STAYHEALTHY COM) 8 September 2000 (2000-09-08) page 5, line 17 -page 8, line 5 -----	1, 3-7



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

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## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/NL 00/00743

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